A Fresh Look at NO to NO2: PVMRM, OLM, and ARM2 in practice

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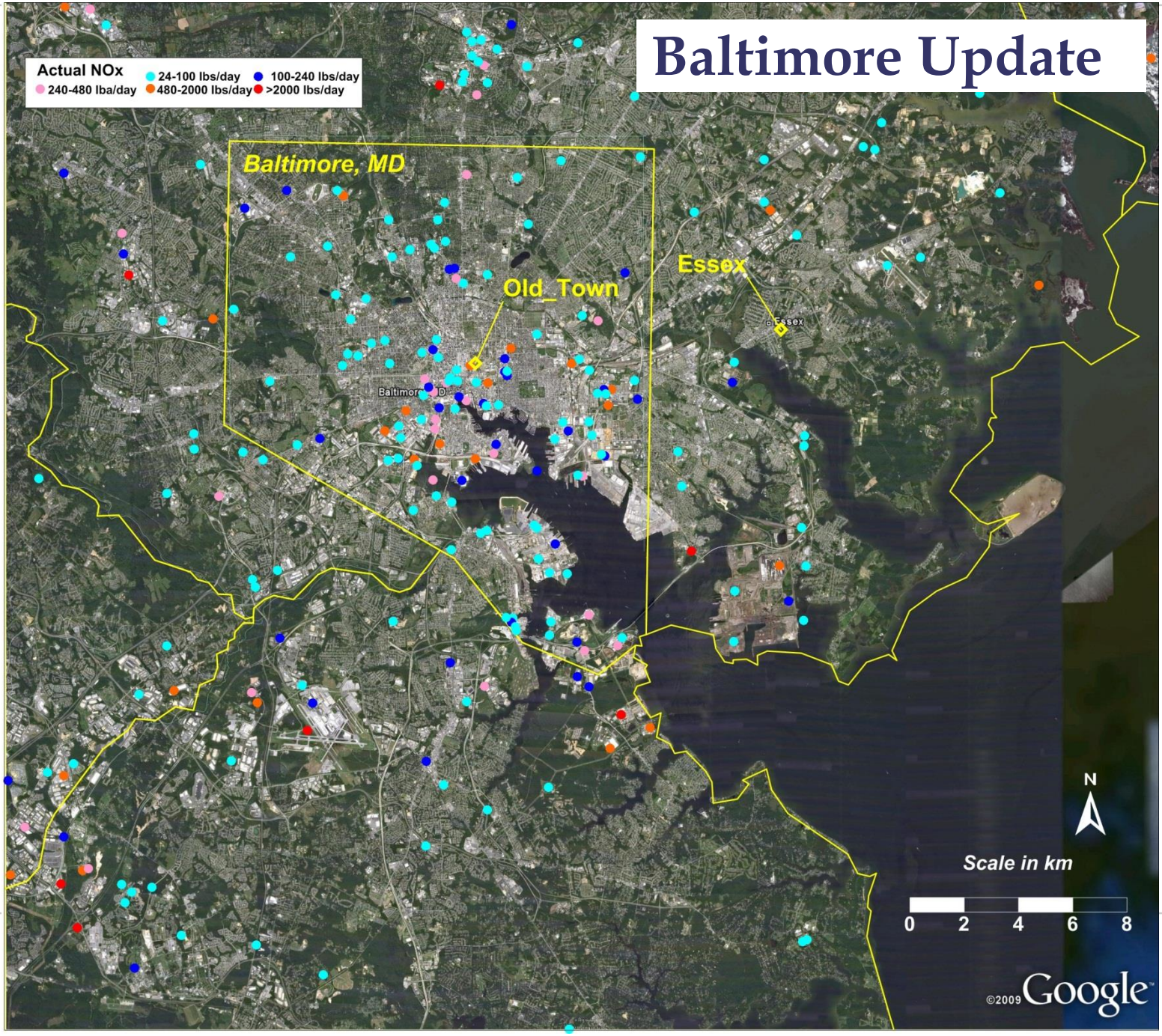
A Brief History

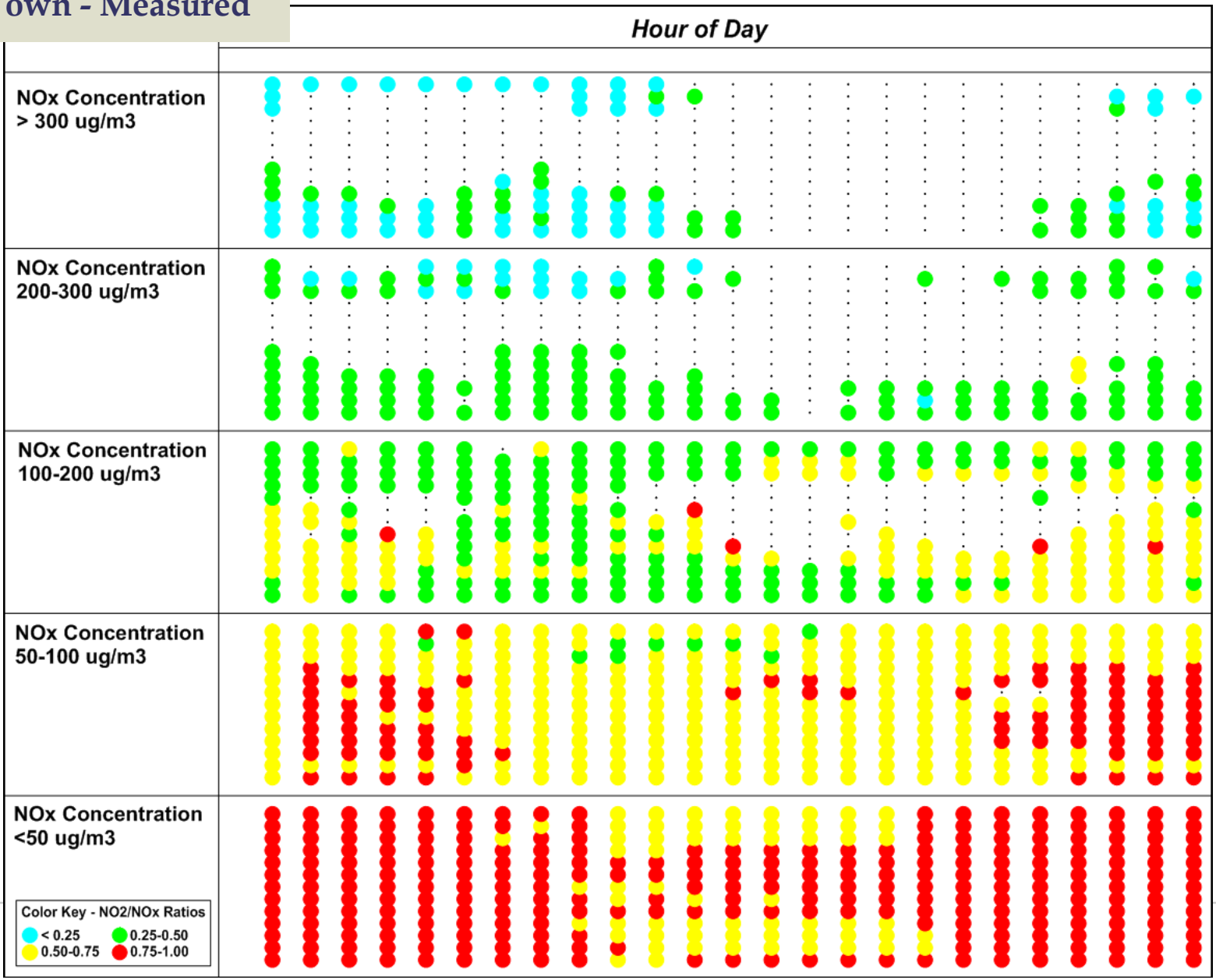
- **In the beginning, there was ARM – 0.75, later 0.8**
- **Along Came Tier 3**
  - OLM – GLC + O3
  - PVMRM – Plume Volume + O3
- **ARM2 – GLC + Ratios**
- **The "Fresh" Look**
  - Baltimore Update
    - Urban Setting; OLM/PVMRM to 14134, ARM2
  - Recent Experience
- **Conclusion: ARM2 to preferred status?**

Baltimore Update

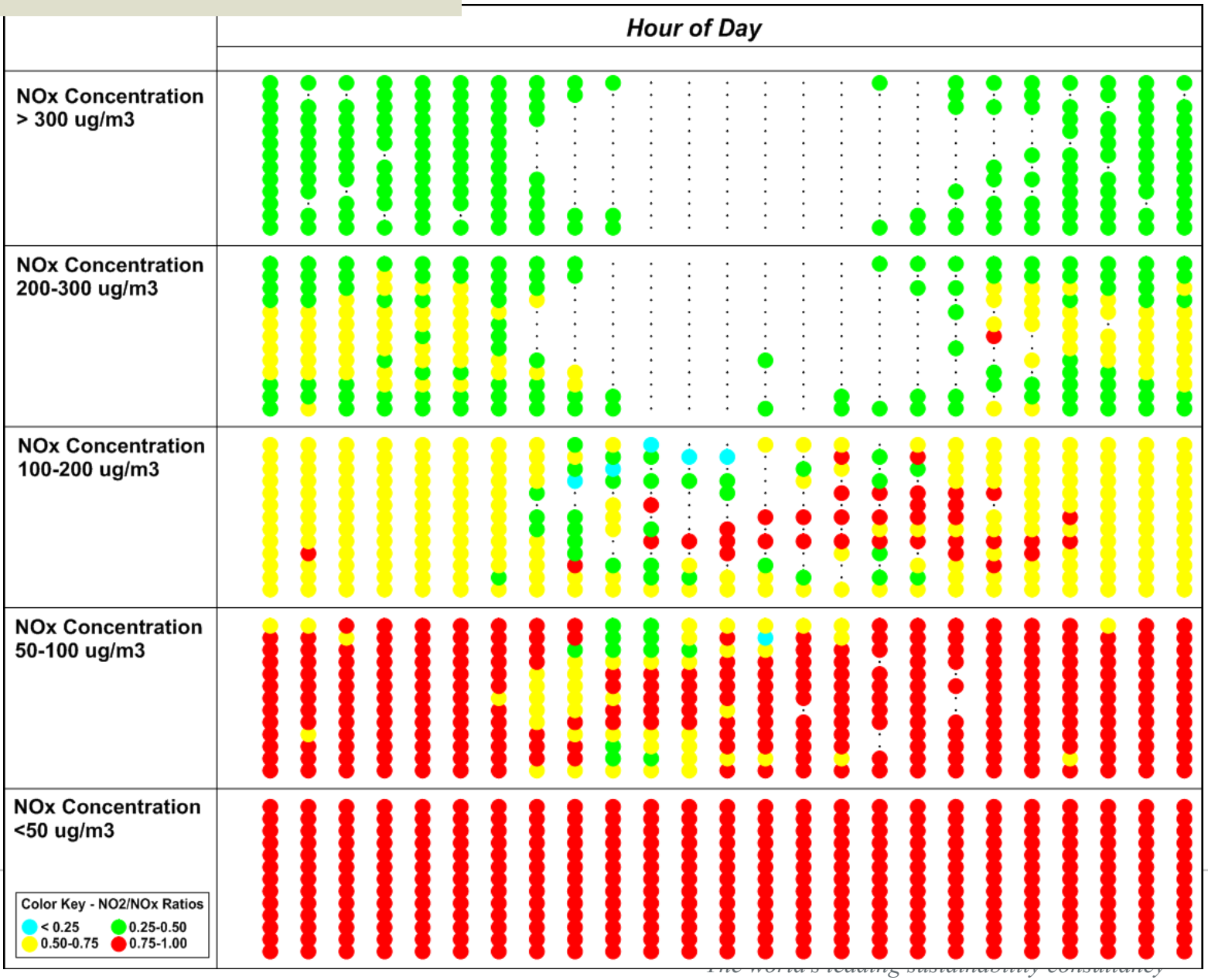


ERM

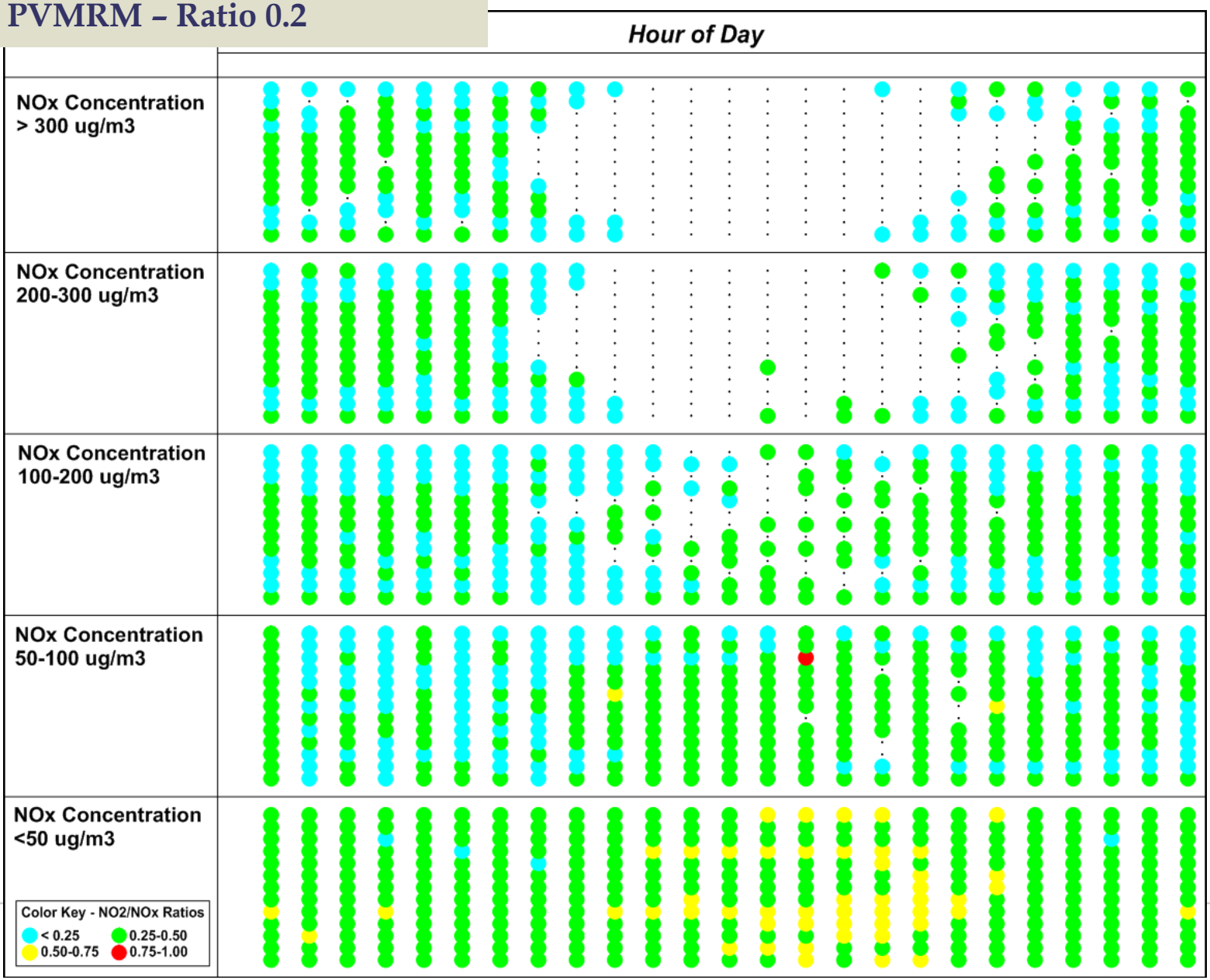
Old Town - Measured



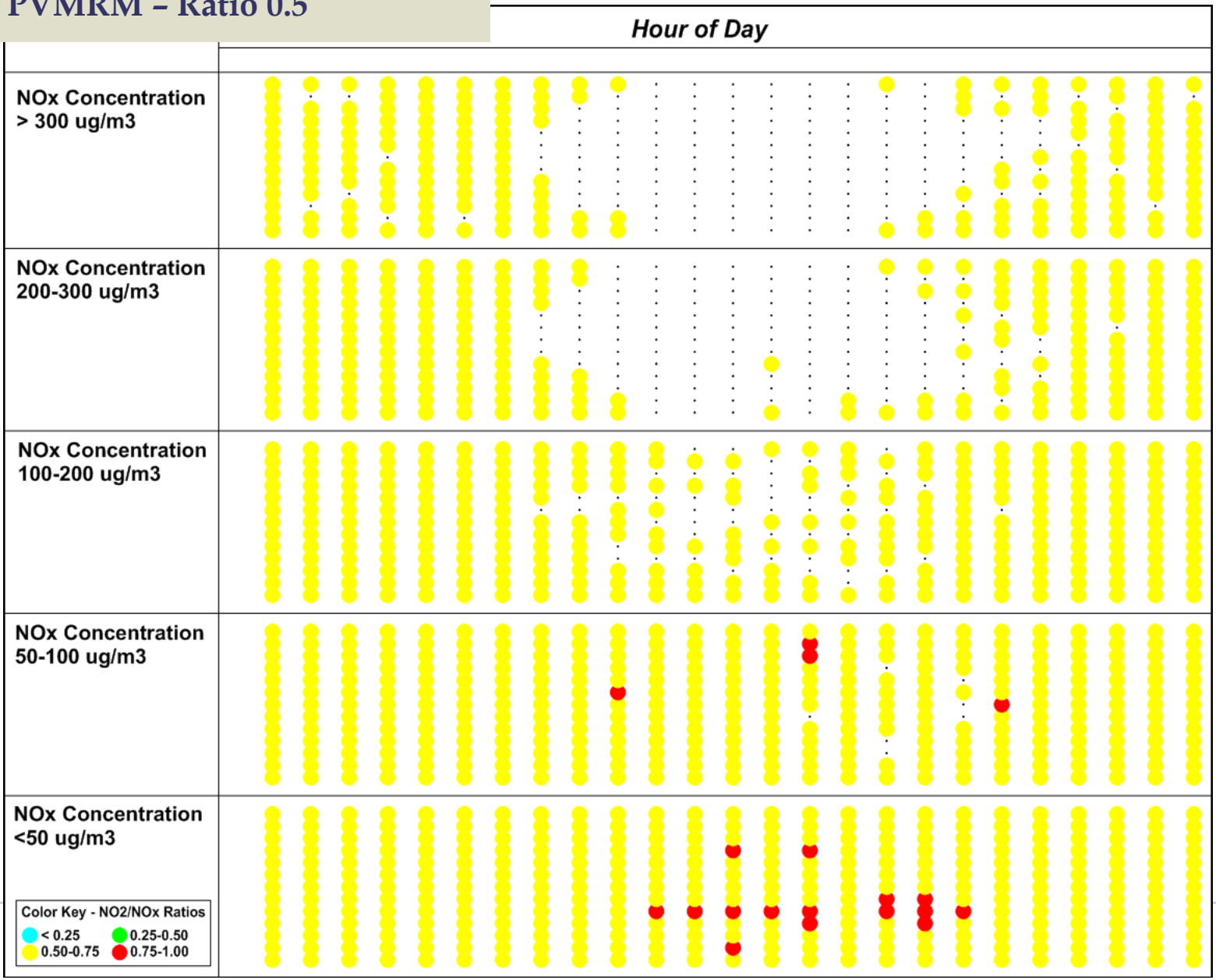
14134 OLM GROUP ALL – Ratio 0.2



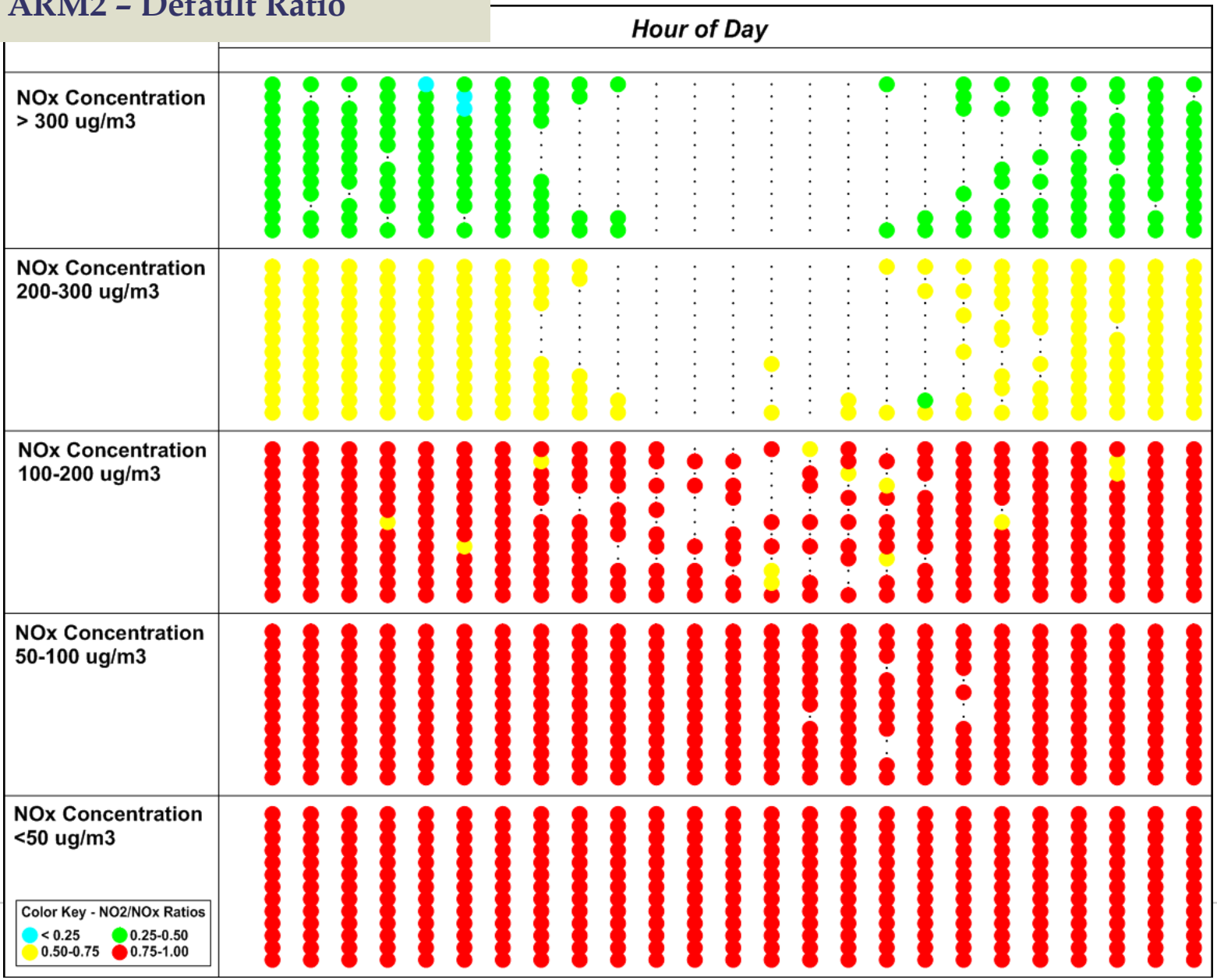
14134 PVMRM – Ratio 0.2



14134 PVMRM – Ratio 0.5



14134 ARM2 – Default Ratio



Recent Experience

- **Several industrial facilities with many sources: mix of small to moderate stack heights, some volume sources, different measured in-stack ratios including some that change over time**
- **Conversion Ratios for a "composite" facility:**

	Percent Conversion		
Group	**OLM 0.2**	**PVMRM 0.2**	**ARM2 0.2**
ALL	42%	82%	42%
Stack Group 1	38%	59%	34%
Stack Group 2	77%	90%	76%
Stack 1	59%	82%	57%
Stack 2	60%	82%	58%
Stack 3	73%	79%	75%
Stack 4	74%	90%	71%
Volume Sources	42%	80%	42%

Summary/Observations

- **Based on a limited study, ARM2 appears to be conservative relative to observed NO to NO2 ratios in an urban, multi-source setting;**
- **For the same setting, OLM matches observed patterns of ambient ratios and is less conservative**
- **PVMRM does not match patterns very well for the urban setting**
- **An in-stack ratio of 0.5 appears to be too conservative for a multi-source setting**

Summary/Observations

- **Examination of predicted conversion ratios for a typical set of industrial sources reveals that PVMRM exhibits apparently conservative ratios (i.e. too much NO2 predicted). Causes appear to be over-estimate of the plume volume compared to NOx mass in the plume volume.**
- **The problem tends to worsen with an increasing number of sources, especially low-level sources. OLM and ARM2 predict what appear to be more realistic ratios**
- **Recommendation: The use of ARM2 should be encouraged, especially for multi-source settings. The minimum ratio can be adjusted if sources being modeled have different or variable in-stack ratios.**

Thank You

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